

hour, causing entire suspension of shipping business. The water in the river rose to a height of five feet above the ordinary level.

*South Carolina.*—Reports from Stateburg, Sumpter county, state that the tornado of the 23d appeared to have developed near Wateree swamp, first striking a point about one-half mile to the west of the old State road to Charleston. From this place it pursued a course nearly eastward for a distance of five miles, the width being about three hundred yards. Within the track of the storm but few trees were left standing. Along the northern border of the track for a distance of fifty or seventy-five yards, the trees, for the most part, fell from north to south; on the southern border for the same distance they fell from south to north, or from southeast to northwest, and along the centre they fell mostly in a direct line from west to east, while a few were observed to lie from east to west.

Charleston, 23d: In Barnwell county the tornado of this date cut a path three-fourths of a mile in width through the Saltkeahatchie swamp, as cleanly as though the timbers had been felled for a railway. Within the storm's path residences and cabins and out-buildings were destroyed on many plantations. Many of the best fields have been so covered with trees and debris that they cannot be cleared in time to be cultivated this year. At Blackville, Barnwell county, a large amount of damage was done by the storm. Nearly everything in its track was blown away or badly damaged. The width of the storm's path was from one-half to three-fourths of a mile, and its duration was about ten minutes.

Bishopville, Sumpter county, 23d: about 8 a. m. of this date a violent wind and rain storm visited this section. The main track of the storm was about one hundred and fifty yards wide, within which trees and buildings were levelled to the ground. So far as has been learned the storm began about four miles west of this place and its track has been followed to Lynch's river.

Saint Stephen's, Berkely county, 23d: during the morning of this date a tornado passed through this section, damaging buildings and blowing down trees.

Darlington, Darlington county, 24th: a tornado coming from a northwest direction and pursuing a zigzag course to the south and east struck this county yesterday. Its track was narrow, and the wind seemed to blow from the borders of the storm towards the centre. Trees, fences and buildings were blown down. The storm was accompanied by vivid lightning, rain and small hail.

*Tennessee.*—Chattanooga, 22d: during the afternoon of this date a tornado passed over this city from southwest to northeast, its main track being about three hundred yards wide and two and one-half miles in length. Diverging from the main storm, a minor track, less than one hundred yards wide, swept around Cameron Hill, rejoining the main track in the northeastern outskirts of the city. The storm continued in full force from 4.40 to 5.10 p. m., with the wind veering rapidly from southeast to northwest, and finally coming around to east at night. The vortical motion of the tornado was clearly shown in the case of a partly finished building facing north-eastward, which was twisted around to the right fully seven feet, and the trees, which also fell from west to east. A large number of buildings were unroofed or otherwise injured, and two cars on the railroad near the river were overturned. The damage to property in this city is estimated at \$10,000.

Knoxville, 23d: The wind and rain storm of last night did but little damage in this locality. The fall of rain (3.75 inches) was the largest that has occurred in any one day at this place during the last five years.

*Texas.*—Sherman, Grayson county, 13th: an unusually severe wind storm struck this place about 12 o'clock last night, doing damage to the extent of several thousand dollars. Several houses were blown down and other were unroofed. The storm lasted for two hours and thirty minutes. Reports from Fort Worth, state that the storm was unusually severe at place.

Dallas, 28th: reports from Bell, Polo Pinto, Hood, Johnson and Fannin counties, state that a severe wind and hail storm passed over those counties during the evening of the 27th, doing great damage to crops, buildings and other property, and causing loss of life. The storm was also severe at Marshall, Harrison county, where several persons were injured. The hail-stones in some places were reported to have been as large as hen's eggs. Among the buildings destroyed were the Masonic hall, the Conatre mills, and one residence. Nearly all of the windows in the town were broken. The storm passed four miles north of Benton, Atascosa county, demolishing houses and doing other damage. Four persons are reported to have been killed.

Fort Davis, 29th: at 4.40 p. m., a violent storm struck this place, blowing down and unroofing several buildings. During the storm the atmosphere was so charged with electricity that it became necessary to disconnect the telegraph instruments from the main line.

*Virginia.*—Richmond: a strong northeasterly gale prevailed here during the 16th and 17th, unroofing a number of buildings and blowing down many trees and fences. On the 22d, a very heavy rain storm occurred, accompanied by a strong northeast wind. The street cars stopped running at 9.30 p. m., on account of the severity of the storm.

## VERIFICATIONS.

### INDICATIONS.

The detailed comparison of the tri-daily indications for April, 1883, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 85.90 per cent. The percentages for the four elements are: weather, 88.72; direction of the wind, 79.43; temperature, 89.13; barometer, 86.14 per cent. By geographical districts, they are: For New England, 84.53; middle Atlantic states, 84.15; south Atlantic states, 86.83; eastern Gulf, 88.28; western Gulf, 88.43; lower lakes, 84.42; upper lakes, 84.60; Ohio valley and Tennessee, 85.48; upper Mississippi valley, 86.20; Missouri valley, 85.92; north Pacific, 92.86; middle Pacific, 81.73; south Pacific, 86.54.

There were sixty-seven omissions to predict (seventeen being due to the absence of reports from the Pacific coast) out of 3,690, or 1.80 per cent. Of the 3,623 predictions that have been made, ninety-four, or 2.59 per cent., are considered to have entirely failed; one hundred and twenty-two, or 3.37 per cent., were one-fourth verified; four hundred and twenty-nine, or 11.84 per cent., were one-half verified; four hundred and forty-four or 12.26 per cent., were three-fourths verified; 2,534, or 69.94 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

### CAUTIONARY SIGNALS.

During April, 1883, one hundred and twenty-four cautionary signals were displayed. Of these, one hundred and thirteen, or 91.1 per cent., were justified by winds of twenty-five miles or more per hour, at or within one hundred miles of the station. Two cautionary off-shore signals were displayed, both of which were justified as to direction and velocity. One hundred and twenty-six signals, of all kinds, were displayed, of which one hundred and fifteen, or 91.3 per cent., were fully justified. These do not include signals ordered at display stations, where the velocity of the wind is only estimated. Eleven signals were ordered late. One hundred and three winds of twenty-five miles or over per hour were reported, for which signals were not ordered; many of these were high local winds or strong sea-breezes.

## NAVIGATION.

### STAGE OF WATER IN RIVERS.

The upper Mississippi river reached its highest stage from the 22d to the 30th, and was lowest during the first part of the month. It was frozen at Saint Paul, Minnesota, until the 6th,

and at La Crosse, Wisconsin, until the 4th. At Cairo, Illinois, the river was highest on the 15th, when it was four feet and three inches above the danger-line. At Memphis, Tennessee, the river was highest from the 20th to 24th, being within eight inches of the danger-line. At Vicksburg, Mississippi, the river fell slowly, but without interruption, after the 7th, but, at the close of the month was still one foot, four inches above the danger point. On the 7th, the river at New Orleans, Louisiana, rose to high-water mark of 1874, and reached its lowest stage on the 27th and 28th, when it was still one foot above the danger-line.

The Ohio river was highest at Pittsburg, Pennsylvania, on the 8th, and at Cincinnati, Ohio, and Louisville, Kentucky, on the 9th, but it did not approach the danger-line at these stations.

The water in the Missouri river was highest from the 18th to 20th and lowest on the 30th.

The Tennessee river rose to within six inches of the danger-line on the 26th, reaching its highest stage on the date.

The Cumberland river at Nashville, Tennessee, rose seventeen feet and three inches during the 22d and 23d, causing serious damage to bridges and railroads.

The highest and lowest stages of water observed at the Signal Service stations during the month of April, 1883, are shown in the following table:

Heights of rivers above low-water mark, April, 1883.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.	
		Date.	Height.	Date.	Height.
<i>Red River:</i>	<i>ft. in.</i>		<i>ft. in.</i>		<i>ft. in.</i>
Shreveport, La.	29 9	23, 24	23 4	3	19 8
<i>Arkansas:</i>					
Little Rock, Ark.	30 0	8	11 7	5	4 4
Fort Smith, Ark.		9	0 11	28	*-2 4
<i>Missouri:</i>					
Yankton, Dak.	20 0	18	9 5	30	4 3
Omaha, Nebr.	16 0	18, 19	13 4	30	7 10
Leavenworth, Kans.	21 0	20	14 5	30	9 6
<i>Mississippi:</i>					
Saint Paul, Minn. †	14 6	22	12 6	9	6 5
La Crosse, Wis. †	18 0	22	10 11	6, 7	4 0
Dubuque, Iowa.	21 10	27, 28, 29	16 8	2	5 4
Davenport, Iowa.	15 0	30	13 1	3	4 4
Keokuk, Iowa.	14 6	30	12 4	4	6 6
Saint Louis, Mo.	30 0	23	20 7	6	15 2
Cairo, Ill.	40 0	15	44 3	1	26 9
Memphis, Tenn.	31 0	20 to 24	33 4	1	19 7
Vicksburg, Miss.	41 0	6	43 10	30	42 4
New Orleans, La. †	-2 6	7, 9	0 0	27, 28	-1 3
Port Eads, La.					
<i>Ohio:</i>					
Pittsburg, Pa.	20 0	8	16 11	5	6 7
Cincinnati, Ohio.	50 0	9	46 3	17	27 3
Louisville, Ky.	24 0	9	22 5	18	10 8
<i>Cumberland:</i>					
Nashville, Tenn.	42 0	7	36 0	21	14 1
<i>Tennessee:</i>					
Chattanooga, Tenn.	33 0	26	32 6	22	11 1
<i>Monongahela:</i>					
Pittsburg, Pa.	29 0	8	16 11	5	6 7
<i>Savannah:</i>					
Augusta, Ga.	30 0	11	27 6	21, 22	8 4
<i>Willamette:</i>					
Portland, Oreg.		1	10 7	29	6 10
Umatilla, Oreg.					
<i>Sacramento:</i>					
Red Bluff, Cal.		3	9 0	29	2 8
Sacramento, Cal.		9	19 9	29	16 3
<i>Mobile:</i>					
Mobile, Ala.		22	18 6	2, 16	15 6
<i>Colorado:</i>					
Yuma, Ariz.		7	18 6	23, 24	17 5

\*Below bench-mark. † Below high-water mark of 1874.

† Observations incomplete. See text.

#### FLOODS.

The heavy rains of the month have resulted in destructive freshets in many of the states; and in the Canadian Provinces and New England, where the monthly precipitation was below the average, the melting of the winter snowfall caused the rivers and streams to rise to heights which proved damaging to property. From the following will be seen the extent to which floods have prevailed in the various districts during April, 1883:

**Arkansas.**—Helena: the heaviest rain known for years fell in this vicinity on the 21st. Six inches of rain fell in as many

hours, flooding a large part of the city. During the night of the 18th, a partly repaired levee gave way, submerging a large area of valuable cotton land, which, owing to the inundation, will not be cultivated this year.

**Georgia.**—Atlanta, 25th: reports from Franklin, Head county, state that during the night of the 22d, Hillatchie creek, six miles from Franklin, rose suddenly, sweeping away a house on its banks and drowning several of the occupants.

**Iowa.**—Des Moines, 6th: the railroad bridge at this place was damaged by the high water in the Des Moines river on this date.

**Kentucky.**—Louisville, 5th: a very heavy rain storm began at 9.10 p. m., and at 10.25 p. m. the rainfall measured 2.10 inches, of which amount 2.00 inches fell in one hour and fifteen minutes. In different parts of the city cellars were flooded and the water rose above the first floors of some buildings, doing considerable damage.

**Louisiana.**—New Orleans, 7th: a very heavy rain storm began at 6.20 a. m. During the succeeding four hours, there fell 5.63 inches of rain, and during the twenty-four hours ending at 10.08 p. m., 8.06 inches, which is the heaviest rainfall on the records of the signal office in this city since its establishment in 1870. On this date the river rose to the highest point reached by the flood in 1874. Great difficulty was experienced by the steamers in delivering freight. The town of Goudsborough was inundated from three to five feet. The track of the Algiers and Goudsborough dummy line was washed away. The water overflowed the levee from Harvey's canal to a point opposite Canal street, flooding a large part of Algiers and causing much damage. A break one hundred and fifty feet wide and seven feet deep occurred in the levee near the Texas and Pacific railway at Goudsborough.

**Minnesota.**—Saint Vincent: during the 21st the Red river rose rapidly, overflowing its banks in several places.

**Mississippi.**—Vicksburg 6th: very heavy rain began at 10.25 a. m., and continued until 3.25 p. m., during which time 4.21 inches of rain fell, and from 10.55 p. m. to 11.55 p. m., about 2.00 inches fell. Many bridges were washed away and other damage done.

**Jackson, 6th:** the heaviest rain of the year fell on this date. Bridges in some parts of the city have been washed away.

**Missouri.**—Cape Girardeau, Cape Girardeau county, 23d: trains were delayed on the Cape Girardeau railroad on account of the overflowed track. The Iron Mountain and Southern railroad was also under water.

**New Hampshire.**—Contoocook, Merrimac county, 13th: all machinery in the mills were stopped on account of the high stage of water in the Merrimac river. In some places the banks of the river were overflowed.

**New York.**—Albany, 16th: the high water in the Hudson on this date submerged the docks, compelling the steamers to deliver freight at points below the city. On the 17th, the river began to fall.

**North Carolina.**—Lenoir, Caldwell county, 22d: the recent heavy rains have caused damage to the mills, bridges and railroads in this vicinity.

**Raleigh, 25th:** extensive damage is reported to have been done by the recent heavy rains. Seven land-slides occurred on the North Carolina railroad, and many trestles were washed away.

**Province of Ontario.**—Niagara Falls, 6th: the heavy rain of the past thirty hours caused a flood at this place which resulted in damage to the extent of several thousand dollars to goods stored in the cellars and basements. Fifty feet of the Canadian southern railroad track were washed away.

**Priceville, 16th:** the mill-dams and bridges on the Saugeen river were damaged by the high water. Three bridges in the township of Proton were carried away and several others were rendered impassable.

**London, 11th:** the Thames river has reached the highest point known for ten years. No damage more serious than the washing away of fences, flooding cellars, etc., has been done in this locality.

**Saint Catharines, 13th:** a serious break has occurred in the mill race of the Hydraulic Race Company. Fifty feet of the break were carried away, and part of the foundation of a factory was undermined.

**Province of Quebec.**—Saint Hyacinthe, 13th: a dam and bridge on the Yamaska river has been carried away causing a loss of \$40,000.

**Ottawa, 13th:** The water in Rideau river rose three feet in five minutes, compelling families to leave their homes along the river banks. The track of the Saint Lawrence and Ottawa railroad was submerged, and a bridge valued at \$15,000 was washed away.

**South Carolina.**—Lancaster, Lancaster county, 24th: the new bridge over the Catawba river, except a small part on the Chester side has been swept away.

Reports from Clarendon county state that the heavy rains of the 22d caused much damage to crops and roads in that section.

**Tennessee.**—Nashville, 7th: over one hundred families were forced to abandon their homes about Nashville on account of the high water in the Cumberland river. On the night of the 21st to 22d, there fell over five inches of rain. The river rose sixteen feet in twenty-four hours, causing serious damage to bridges and railroads. A number of rafts broke from their fastenings, and a large amount of cord-wood and valuable lumber was lost.

**Knoxville, 22d:** very heavy rain fell during the evening—over three inches in seven hours. On the 23d the river rose twenty feet in a few hours, flooding the basements and cellars of several houses. A land-slide occurred on the Knoxville and Ohio railroad. With this exception no other serious damage resulted in this vicinity.

**Vermont.**—Richford, Franklin county, 12th: a washout occurred on the Southeastern railroad on this date, causing delay of trains.

**Bellow's Falls, Windham county, 13th:** the water in the Connecticut river washed away about sixty feet of the river bank on this date. The high water is due to the recent heavy rains and the melting of the winter snowfall.

**North Troy, Orleans county, 13th:** several bridges in this locality have been carried away, and the roads are submerged.

**Virginia.**—Petersburg, 17th: the creeks are greatly swollen, washing away bridges in the county. The Appomattox river at Farnville rose three feet above its ordinary level. At this place water covered the wharves.

**Wisconsin.**—Menomonee, Dunn county, 18th: the Menomonee river rose to a point two feet above any previous high-water mark. No serious damage was done in the immediate vicinity of Menomonee, but the high water will cause suspension of operations in the mills for about two weeks. At Cedar Falls, about six miles above Menomonee, the dams and mills were badly injured, and several weeks will be required to repair the damage. At Rice lake, sixty miles above, a large area was flooded and a large amount of damage done. At Downsville, twelve miles below Menomonee, several buildings were washed away. On the Chippewa river the dams along its course were badly washed. Several weeks will be required before travel on the railroads in that locality will be resumed.

#### HIGH TIDES.

Portsmouth, North Carolina, 17th, 18th.

#### ICE IN RIVERS AND HARBORS.

**Gulf of Saint Lawrence.**—Reports from Magdalen Islands on the 4th stated that the Gulf was clear of ice around the islands. Small fields of ice were reported from the southward and westward of North Sydney, Cape Breton Island. On the 12th, the Gulf north of the islands was again covered with ice, which was drifting slowly eastward.

**Saint Lawrence river.**—Montreal, Province of Quebec, 28th: navigation is now open; several steamers have arrived in port.

**Ottawa river.**—Ottawa, Province of Ontario, 16th: the ice started in the river on this date.

**Lake Ontario.**—Rochester, New York, 2d: the first boat of the season arrived on this date. Reports from Madison Barracks, New York, stated that Henderson bay was free from ice on the 20th.

**Oswego, New York:** the harbor at this place was clear of ice and open to navigation on the 5th. The steamer "D. R. Van Allen," first boat of the season, arrived on this date, and reported having encountered considerable ice on her passage. The harbor was again closed by ice from the 6th to 9th. The steamer "D. R. Van Allen" and the steam-barge "T. Kingston" were the last to leave this port. The schooner "Carolina Marsh," from Port Hope, arrived at Fair Haven on the night of the 9th, where she was detained by ice. She arrived at this port on the morning of the 11th, being the first sailing vessel to arrive this season. There were several arrivals during the day, all reporting large quantities of ice in the lake. On the 14th, the harbor was clear of ice, and vessels experienced no inconvenience in arriving and departing.

**Penobscot river.**—Bangor, Maine, 13th: navigation open; the steamer "Cambridge" arrived on this date.

**Hudson river.**—Albany, New York: floating ice from 1st to 10th: river free of ice on the 11th.

**Lake Whitney.**—New Haven, Connecticut, 5th: lake clear of ice. In 1882, the lake was free of ice by March 3d.

**Broad Lake.**—Burlington, Vermont: ice broke up in the lake on the 22d; navigation opened 24th.

**Lake Erie.**—Cleveland, Ohio, 5th: ice started from the shore and passed out, leaving the lake in front of the city free of ice. The steamer "City of Detroit" left on the 7th, for Detroit, Michigan, being the first departure of the season.

**Toledo, Ohio, 7th:** the tug "Green" left this port for Sandusky, Ohio, on the 5th, and experienced a dangerous passage, being caught in the ice. The bay was reported to be full of ice extending as far as the eye could reach. Navigation between this port, Detroit, Michigan, and Sandusky, Ohio, was fully open on the 9th. Navigation between this port and Cleveland, Ohio, was open by the 14th. The propeller "Gault," from Buffalo, New York, arrived on the 26th, at which time navigation on Lake Erie was fully open. The Maumee river was nearly free of ice at this place on the 1st.

**Erie, Pennsylvania:** Presque Isle bay was clear of ice on the 8th, but the entrance to the bay remained obstructed. Navigation opened on the 25th, the propeller "Wocoken" arriving from Toledo, Ohio, on that date.

**Buffalo, New York:** the lake at this place was open to navigation on the 23d, but the first arrival and departure occurred on the 25th. Large quantities of ice came into the harbor on the 27th, and on the 29th navigation was interrupted by it. On the 30th, there was still considerable loose ice, but it did not interfere with navigation. The creek became clear of ice on the 7th, having been frozen since December 18, 1882.

**Lake Huron.**—Port Huron, Michigan: on the 12th, the lake was clear of ice as far as the eye could reach, but ice-fields were visible on the 13th. The first boat of the season, steamer "Idlewild," arrived from Detroit on the 17th, and departed for the upper lakes on the 18th.

**Lake Michigan.**—Grand Haven, Michigan, 4th: the propeller "Saint Joe," from Chicago, Illinois, and the schooner "O. Shaw," from South Haven, Michigan, were the first boats of the season to arrive at this port.

**Grand Traverse bay.**—Northport, Michigan: ice moved out of the bay on the 15th.

**Thunder bay.**—Alpena, Michigan: the tug "Golden Eagle" left this port for Block river on the 16th, being the first departure of the season.

**Straits of Mackinaw.**—Mackinaw City, Michigan: on the 7th, the ice in the straits, although from twelve to forty inches thick, showed signs of weakening. Stages plying between here and Point Saint Ignace, stopped their regular winter trips on this date. On the 11th, a double team with 1,900 pounds of freight crossed the straits to Point Saint Ignace, the ice being unusually solid for this season of the year. On the 15th, the

ice began to loosen along the shores but remained solid in the channel. The steamer "Algomah" arrived on the 17th and reported the ice to be solid or dammed from McGulpin's Point to the main-land. The steamers "City of Cleveland" and "Flora" arrived at Mackinaw Island on the 21st; on this date the north channel was clear of ice. The propeller "Atlantic," the first boat of the season, passed through the south passage on the 25th. On the 28th the straits were open to navigation.

*Little Bay de Noquet.*—Escanaba, Michigan: the bay became clear of ice on the 24th and the tug "Shipman" arrived on the 25th. The first passenger steamer of the season arrived from Green Bay on the 26th.

*Saint Clair river.*—Port Huron, Michigan: floating ice on the 3d and 4th and from the 6th to 9th; ice dam on the 13th, the ice measuring twenty-nine inches in thickness. The ice in Black river broke up on the 8th.

*Detroit river.*—Detroit, Michigan: drift-ice in river on 1st, 2d, 3d, 5th, 7th, 8th, and from 11th to 17th.

*Lake Superior.*—Marquette, Michigan, 19th: ice left the harbor during the morning of this date.

*Embarras and Wolf rivers.*—Embarras, Wisconsin: ice in the Embarras and Wolf rivers broke up on the 11th.

*Red River of the North.*—Moorhead, Minnesota: the ice broke up on the 9th, and on the 16th, the river was clear of ice. On the 19th, the steamer "Pluck" left for points down the river, being the first boat of the season.

Saint Vincent, Minnesota: the ice broke up on the 19th.

*Mississippi river.*—La Crosse, Wisconsin, 4th: the ice broke up and formed a dam below the city, which broke during the morning of the 5th. The first steamer ("Minneapolis") of the season arrived from Saint Louis on the 6th.

Saint Paul, Minnesota, 6th: the ice-dam which formed below Wabasha street broke during the afternoon, the ice passing away without damage. The first steamer ("Mary Norton") from Saint Louis arrived on the 20th.

*Missouri river.*—Fort Stevenson, Dakota: on the 9th, the ice broke along the shores, but remained firm in the channel. During the evening of the 10th, the ice broke up, but became dammed on the afternoon of the 11th. During the 11th and 12th the river rose rapidly, the ice causing considerable damage. The ice-dam broke during the evening of the 12th. The first steamer ("Eclipse") of the season departed on the 18th.

Tobacco Garden, Dakota, 15th: navigation resumed; first departure on this date.

Bismarck, Dakota, 10th: the ice broke at 2.30 p. m. of this date, and passed out without damage.

Fort Bennett, Dakota, 16th: the steamer "Roseburg," the first boat of the season, arrived at this date.

Fort Buford, Dakota: ice broke in the river at this place on the 10th.

Fort Sully, Dakota: the first steamer of the season arrived from the lower Missouri on the 16th.

*Miscellaneous.*—Pointe de Lac, Province of Quebec, 16th: the ice on Lake Saint Petre is still solid. At Three rivers, Province of Quebec, the ice was firm on the 16th, and at Batis-can, Province of Quebec, the ice broke up on that date.

Saint John's, Newfoundland, 28th: the Mississippi and Dominion Company's steamer "Ontario" passed Cape Race on the evening of the 27th, being the first ocean steamer sighted this season, with the exception of boats calling at Saint John's.

Bangor, Maine: the ice in Kenauskeag springs passed out during the night of the 9th.

Wicklow, Dakota: ice began to break up on the 14th and disappeared from the lake on the 17th.

#### TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors at the Signal Service stations, with the average depth at which the observations were made, and the mean temperature of the air at the various stations, are given in the table below. Observations were interrupted by ice at the following stations: Mackinaw City, Michigan, from 1st, to 17th, and from 21st to

30th; Milwaukee, Wisconsin, from 1st to 15th; Buffalo, New York, from 1st to 6th; Escanaba, Michigan, from 1st to 18th; Chicago, Illinois, from 1st to 8th; Cleveland, Ohio, from 1st to 8th; Marquette, Michigan, from 1st to 18th; Detroit, Michigan, 1st, 2d, 13th, 14th, 15th; Duluth, Minnesota, from 1st to 7th. At Chicago, the thermometer was broken on the 25th, and no observations were made after that date.

The highest observed temperatures of water during April, 1883, compared with those of April, 1882, show a decrease of from 1° to 9° at stations along the Atlantic coast, between Eastport, Maine, and Jacksonville, Florida, with the exception of the latter station, and Chincoteague, Virginia, where they were 1° higher than in April, 1882. A comparison of the lowest observed water temperatures at stations along the Atlantic coast for the same periods, shows that, with the exception of Sandy Hook, New Jersey, and Portland, Maine, where they are a fraction of a degree higher, the temperatures are from 1° to 12° lower than those of last year.

Temperature of Water for April, 1883.

STATION.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Alpena, Michigan*	41.3	30.5	10.8	ft. in.	35.1
Augusta, Georgia	70.0	58.0	12.0	13 0	64.5
Baltimore, Maryland	54.5	41.5	13.0	9 10	52.1
Block Island, Rhode Island	45.7	36.3	9.4	8 11	42.6
Boston, Massachusetts	46.1	34.2	11.9	20 1	44.3
Buffalo, New York*	50.3	33.4	16.9	9 8	40.2
Cedar Keys, Florida	82.0	68.0	14.0	9 10	72.6
Charleston, South Carolina	68.0	57.9	10.1	40 0	64.0
Chicago, Illinois*	50.9	40.2	10.7	6 11	45.6
Chincoteague, Virginia	60.0	42.0	18.0	5 11	49.1
Cleveland, Ohio*	46.1	33.1	13.0	14 0	44.0
Detroit, Michigan*	47.5	34.0	13.5	23 5	46.2
Delaware Breakwater, Delaware	53.9	39.4	14.5	9 4	47.3
Duluth, Minnesota*	42.3	34.2	8.1	15 4	40.3
Eastport, Maine	36.5	32.6	3.9	16 5	38.0
Escanaba, Michigan*	39.5	31.0	5.5	15 0	36.2
Galveston, Texas	75.0	61.0	14.0	13 8	70.6
Grand Haven, Michigan	56.1	37.1	19.0	19 0	44.4
Indianola, Texas	77.5	64.5	13.0	9 5	71.3
Jacksonville, Florida	77.0	65.0	12.0	18 0	70.1
Key West, Florida	84.3	74.8	9.5	16 9	79.2
Mackinaw City, Michigan*	37.2	33.2	4.0	13 0	35.9
Marquette, Michigan*	38.0	37.0	1.0	9 10	35.9
Milwaukee, Wisconsin*	47.1	42.1	5.0	8 0	43.0
Mobile, Alabama	72.5	63.0	9.5	16 10	68.8
New Haven, Connecticut	50.3	36.1	14.2	14 10	44.2
New London, Connecticut	45.0	38.0	7.0	12 7	45.2
New York City	40.7	37.2	9.5	16 10	46.6
Norfolk, Virginia	61.0	47.0	14.0	17 0	55.8
Pensacola, Florida	75.8	65.9	9.9	18 5	68.9
Portland, Maine	40.7	34.5	6.2	18 5	44.7
Portland, Oregon	51.0	45.2	5.8	48 7	49.2
Provincetown, Massachusetts	46.5	34.5	12.0	14 0	41.8
Punta Rassa, Florida	85.0	76.6	8.4	11 4	75.1
Sandy Hook, New Jersey	46.5	42.8	3.7	1 6	46.6
San Francisco, California	56.5	52.4	4.1	29 1	52.4
Savannah, Georgia	68.4	57.0	11.4	12 11	67.7
Smithville, North Carolina	63.0	58.0	5.0	10 0	59.2
Toledo, Ohio	58.3	37.8	20.5	11 3	47.4
Wilmington, North Carolina	65.5	49.0	16.5	13 0	61.3

\*Observations incomplete. See text.

#### ATMOSPHERIC ELECTRICITY.

##### AURORAS.

The auroral display which occurred during the evening of April 3d, was generally observed in Canada, New England, the lower lake region, and at a few of the most northerly stations in the middle Atlantic states. At most of the stations where this display was observed, it was of ordinary brilliancy. At Eastport, Maine, it was visible from 7 p. m. until the early morning of the 4th, and consisted of a low arch extending from north-northwest to northeast. Several streamers of whitish color tinged with crimson appeared between the north and northeast.

At Freehold, New Jersey, this display was observed at 7.30 p. m., in the form of a white glow, with several long narrow streamers. It faded away at 8.30 and reappeared at 10 p. m. The only western stations reporting auroras on the evening of the 3d were Saint Vincent, Minnesota, and Dayton, Washington Territory. At the latter station, it was described as